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From (2), we easily get $x=a\log_e[(y+\sqrt{y^2-a^2})/a]=a\log_e[(s+\sqrt{s^2+a^2})/a]=(s^2-y^2)/2y\log[(s+y)/(s-y)]\div\log_{10}e$.

$\therefore\ \log x=\log(s+y)+\log(s-y)+\log[\log(s+y)-\log(s-y)]-\log y-\log[2\log_{10}e]$.
$=\log(s+y)+\log(s-y)+\log[\log(s+y)-\log(s-y)]+\text{colog}\,y+0.0612$.

From this equation, since $x=40$m and $s=50$m, we find, by the Method of Double Position, the value of $y=26.53$m which is called the sag.

The tension at $A=wa=w\left(\frac{s^2-y^2}{2y}\right)=1559.78$ oz., and $\frac{FI}{EI}=\frac{a}{s}$ $=.6797$ the *batter*.

From the above equations we may obtain the four propositions as given in Wentworth and Hill's High School Arithmetic.

35. Proposed by B. F. FINKEL, Professor of Mathematics in Kidder Institute, Kidder, Missouri.

Between Sing-Sing and Tarry-Town, I met my worthy friend, John Brown,
And seven daughters, riding nags, and every one had seven bags:
In every bag were thirty cats, and every cat had forty rats,
Besides a brood of fifty kittens. All *but* the nags were wearing mittens!
Mittens, kittens—cats, rats—bags, nags—Browns,
How many were met between the towns?

[From *Mattoon's Common Arithmetic.*].

Solution by FRANK HORN, Columbia, Missouri.

II.
1. 8=number of Browns met.
2. 8=8×1=number of nags.
3. 56=8×7=number of bags.
4. 1680=30×56=number of cats.
5. 67200=1680×40=number of rats.
6. 84000=1680×50=number of kittens.
7. 167888=Browns+cats+rats+kittens.
8. 335776=167888×2=number of mittens worn provided that each person, cat, rat, and kitten wore one pair.
9. 636616=Browns+nags+bags+cats+rats+mittens+kittens.

III. $\therefore$ The number of objects and persons met amounted to 636616.

NOTE.—The result given in Mattoon's Arithmetic is 2184192. What interpretation did Mr. Mattoon give to the problem?—EDITOR.

PROBLEMS.

42. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in New Windsor College, New Windsor, Maryland.

If $m=2$ct. be the interest on $M=100$ct. for $p=10$ days, find the yearly rate per cent.

43. Proposed by B. F. BURLESON, Oneida Castle, New York.

A, in a scuffle, seized on $\frac{2}{3}$ of a parcel of sugar plums; *B* caught $\frac{3}{8}$ of it out of his hands, and *C* laid hold on $\frac{3}{10}$ more; *D* ran off with all *A* had left, except $\frac{1}{7}$ which *E* afterwards secured slyly for himself; then *A* and *C* jointly they all went anew, for what it contained; of which, *A* got $\frac{1}{4}$, *B* $\frac{1}{3}$, and *D* $\frac{2}{7}$, and *C* and *E* equal shares of what was left of that stock. *D* then struck $\frac{3}{4}$ of what *A* and *B* last acquired, out of their hands; they, with difficulty, recovered $\frac{5}{8}$ of it in equal shares again, but the other three carried off $\frac{1}{8}$ apiece of the same. Upon this, they called a truce, and agreed that the $\frac{1}{3}$ of the whole, left by *A* at first, should be equally divided among them. How much of the prize, after this distribution, remained with each of the competitors?

set upon *B*, who, in the conflict, let fall $\frac{1}{2}$ he had, which were equally picked up by *D* and *E*, who lay perdu. *B* then kicked down *C*'s hat, and to work

* * *

ALGEBRA.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

SOLUTIONS OF PROBLEMS.

32. **Proposed by LEV. WEINER, Professor of Modern Languages, Missouri State University, Columbia, Missouri.**

Find a number consisting of 6 digits which when multiplied by the first 6 natural numbers gives the same digits in rotation.

I. Solution by LEONARD E DICKSON, M. A., Fellow in Mathematics, University of Chicago.

In a memoir on "Numbers with cyclic multiples" soon to be published. I have completely discussed general problems of which this is a very special case. One of my results is that there is only one number of more than one digit which when multiplied by as many different integers as the number contains digits each product has the same digits as the original number and in the same cyclic order. This number is 142857, which answers the problem.

$$\begin{aligned}\times1&=142857\\ \times2&=285714\\ \times3&=428571\\ \times4&=571428\\ \times5&=714285\\ \times6&=857142.\end{aligned}$$

Important to note is that the number $\times7=999{,}999$. If in any of the above six multiples we add the number composed of the first three digits to that composed of the last three, the sum is 999.

II. Solution by the PROPOSER.

Let the digits be a, b, c, d, e, f, and let A, B, C, D, E be some one of the first 6 numbers but 1, respectively; then